

EXPERIENCE WITH 4-D ASSESSMENT IN THE AVIONICS AND ELECTRICAL SYSTEMS DIVISION

Summary:

This presentation provides a brief overview of GRC power capabilities and a review of a “4-D” team building assessment conducted for the Avionics and Electrical Systems Division.



Experience With 4-D Assessment in the Avionics and Electrical Systems Division

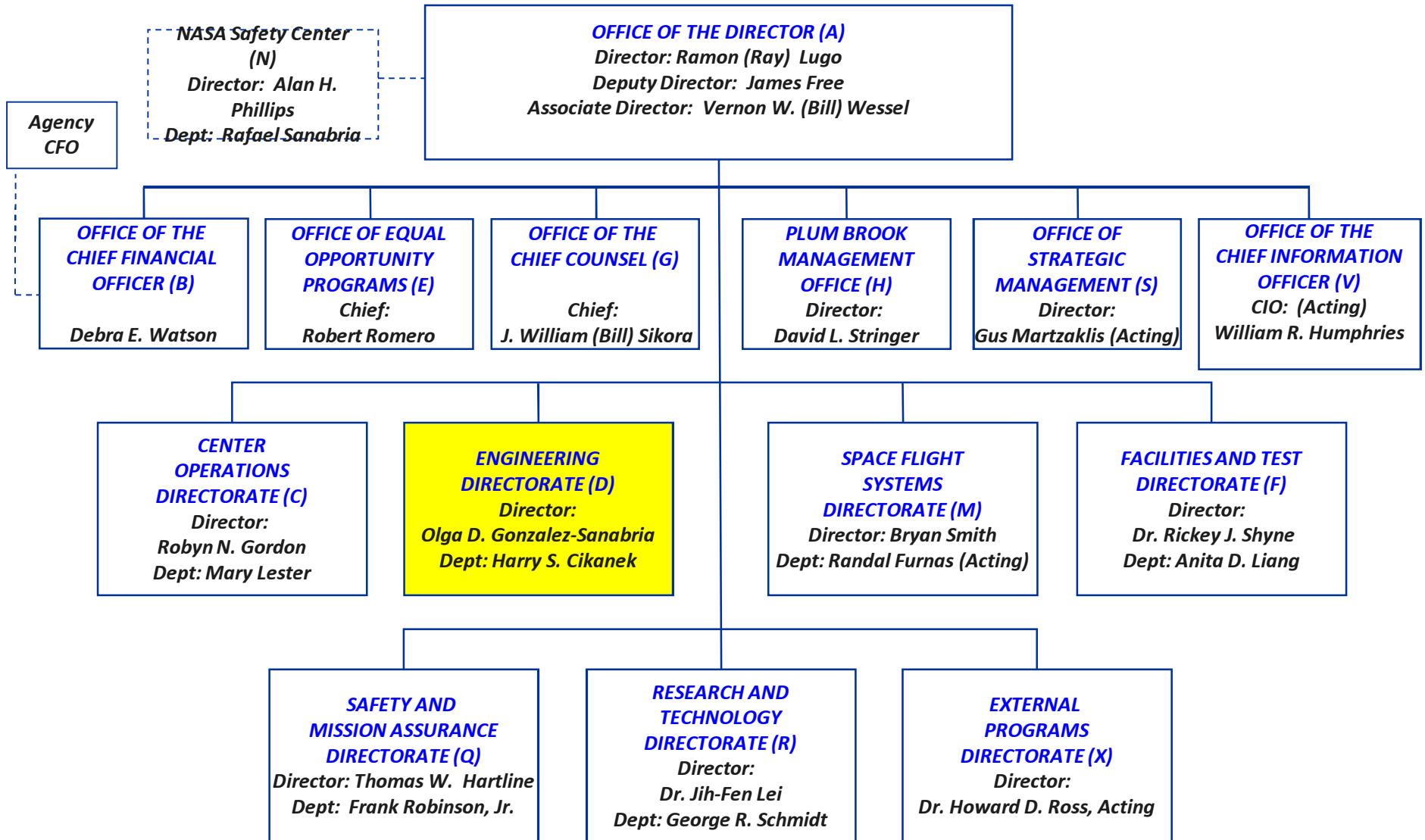
***NASA Glenn Research Center
John D. Taylor***

February 17, 2011

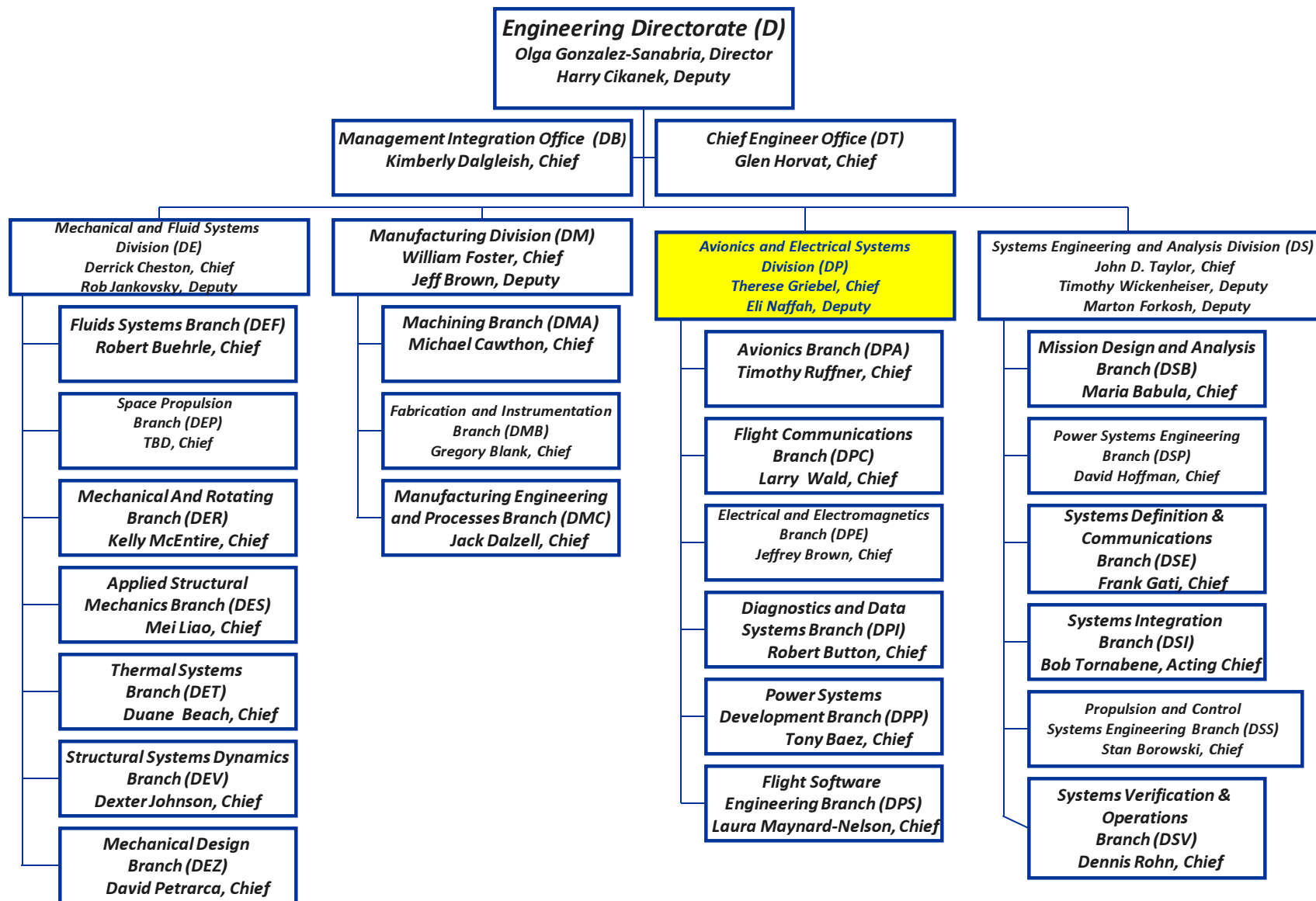
Outline

- ***Brief Overview of Power Responsibilities Within the Division***
- ***4-D Assessment Results***

John H. Glenn Research Center at Lewis Field (GRC)



Code D/Engineering Directorate



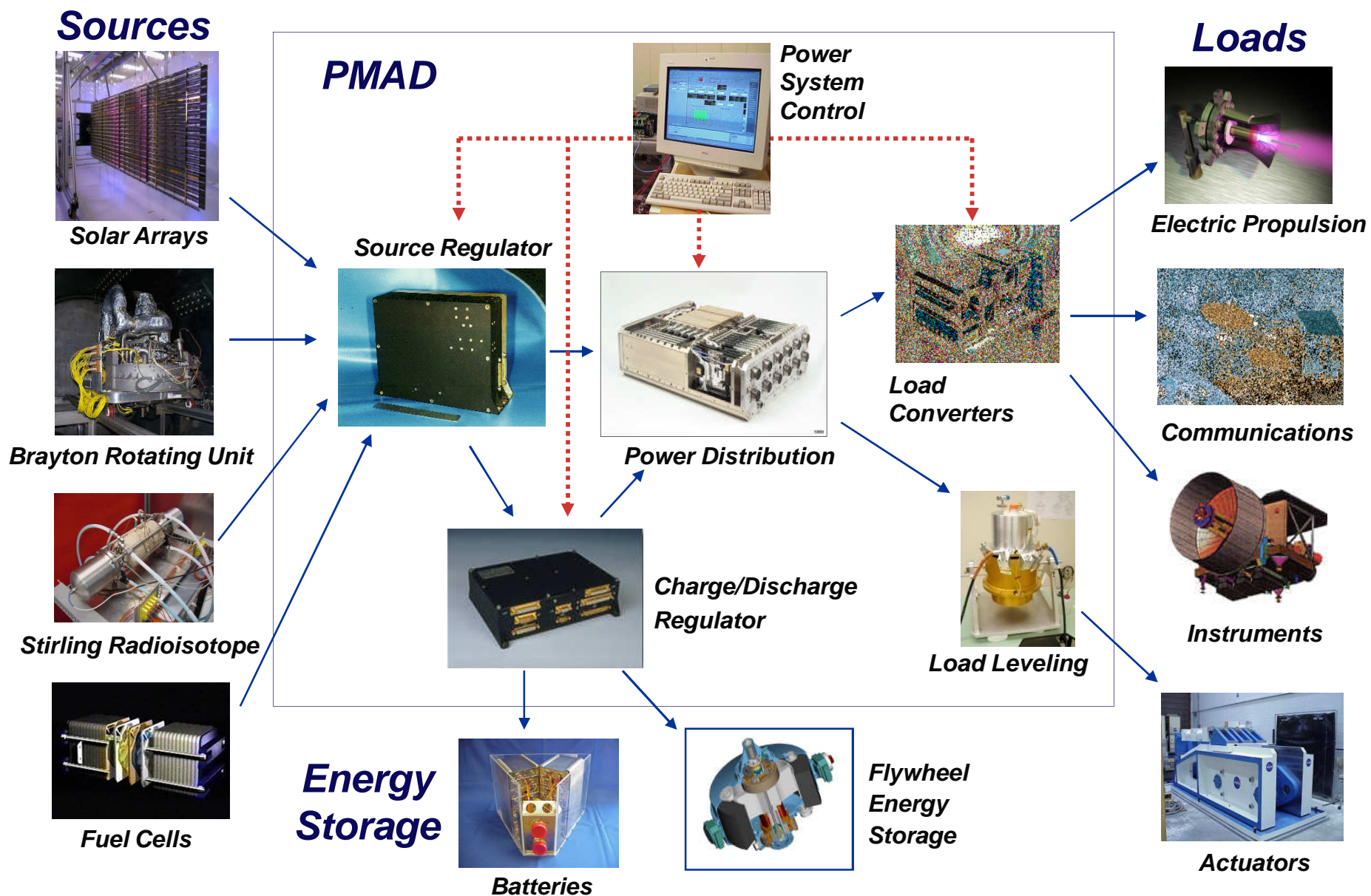
Power Competencies and Capabilities

- ***Core Competencies***
 - ***Power System Architecture Design***
 - ***Power Systems Modeling and Analysis***
 - ***Power Systems Controls***
 - ***Power Components DDT&E***
 - ***Motor Control DDT&E***
 - ***Flywheel Systems DDT&E***
 - ***Electro-Mechanical Actuator DDT&E***
 - ***End –to-end (sources to loads) Power System Testing and Verification***
- ***Capabilities***
 - ***Power Systems Development Laboratory (PSDL)***
 - ***Major analytical tools include: Simplere, Pspice, Simulink, MATLAB, Solid Works, and Satellite Tool Kit.***

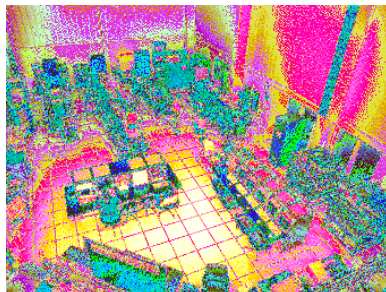
Current NASA Power Needs

- ***Human Exploration***
 - ***Orion power system support***
 - ***Ares I power system (Architecture)***
 - ***EVA power (Architecture)***
 - ***Advanced Battery Technology***
 - ***Altair power system (Architecture)***
 - ***Ares V power system (Architecture)***
 - ***Constellation Level II Power SIG***
 - ***Lunar base and settlement (Architecture)***
 - ***Regen Fuel Cells (Technology)***
- ***Aeronautics***
 - ***Turboelectric Aircraft Propulsion***
- ***ISS resource utilization***
 - ***Spacecraft operations***
 - ***Operations program integration***
- ***Unmanned robotic exploration***
 - ***Radioisotope Stirling end-to-end power for deep space***
 - ***Advanced fission based power***
- ***Earth Observation***

Taxonomy of a Power System



Glenn Research Center Accomplishments



Space Station PMAD Test-Bed

*Integrated Solar Upper Stage
PMAD System*



*ISS Circuit
Interrupt
Device*



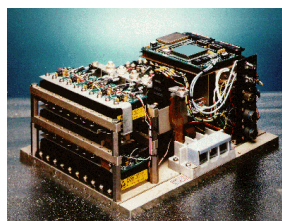
2kW Brayton Controller



*Intelligent dc-dc
Converter*



*Modular dc-dc
Converter*



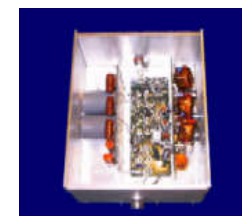
*High Current
Remote Power Controller*



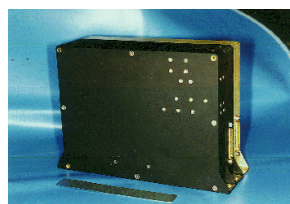
*Fluid Combustion Facility
Electrical Power Control Unit*



Backup DDCU



*Modular High
Voltage Switch*



*Photovoltaic Regulator
Kit Experiment*



*Peak Power Tracking, High
Voltage Array Regulator*



*Shuttle Electric APU
Fuse/Switch*



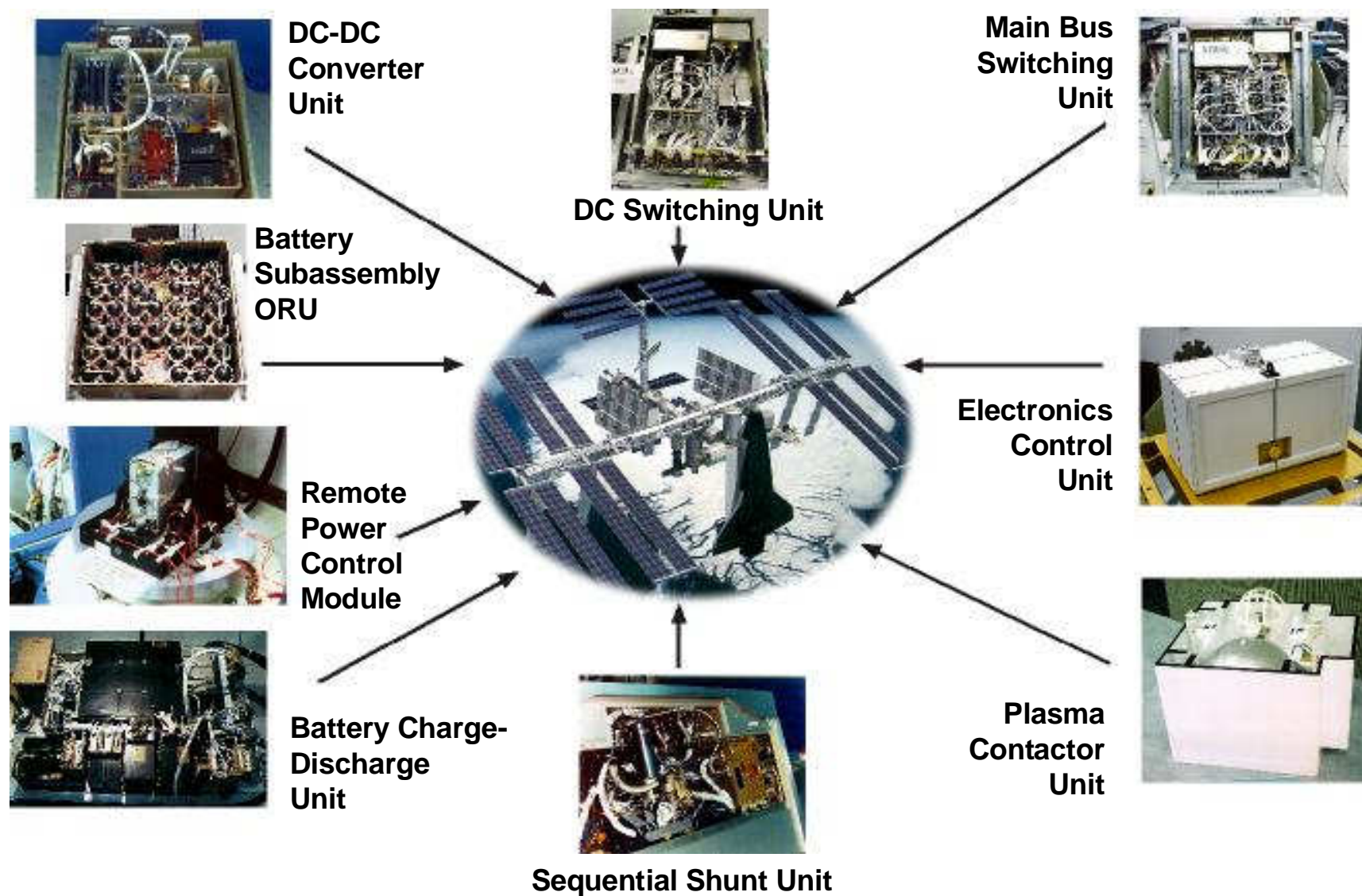
*High Power Actuator for
More Electric Vehicles*

1992

1998

Present

GRC's ISS Power System Contributions



Current Projects and Activities

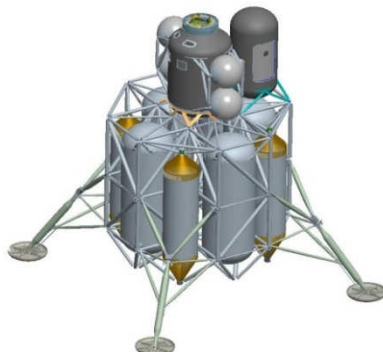
**Ares V
EPS DDT&E**



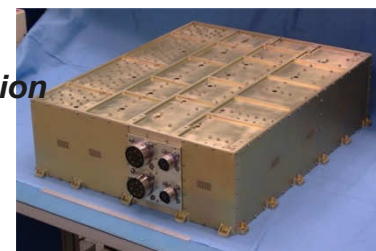
**ORION EPS Subsystem
Design**



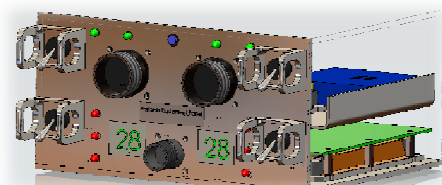
**ALTAIR Lunar
Lander EPS Design**



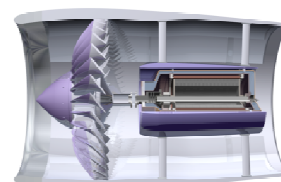
Cx Power System Integration



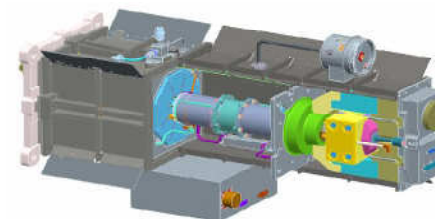
**NEXT Electric Propulsion
Power Processing Unit**



CX Portable Equipment Panel



**Turbosupercharger Aircraft
Superconducting Motors**



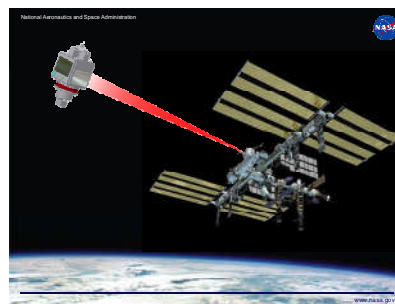
Radioisotope Power Systems



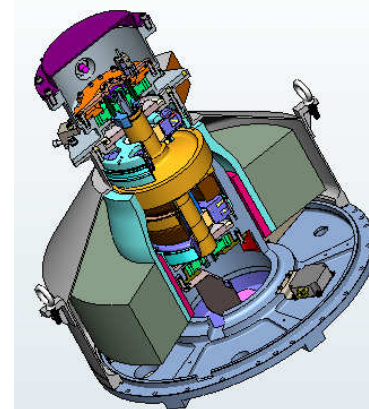
Ares I EPS DDT&E



ORION EPS Test Platform



Power Beaming



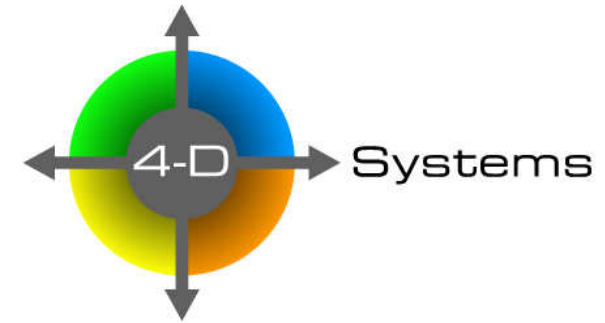
Flywheel Systems Development

Opportunities to Address NASA Needs

- ***Unique power systems for selective application***
 - ***Wireless power transfer (power beaming)***
 - ***Integrated power and attitude control (ISS, Flywheel)***
 - ***Radioisotope Stirling end-to-end power for deep space***
- ***Advanced Drive Systems***
 - ***Rovers***
 - ***Aero propulsion (Decoupling of compressor and fan)***
 - ***Aero propulsion primary power***
 - ***All electric aero and launch vehicle systems (Elimination of hydraulics)***
- ***Energy Storage Methodologies***
 - ***Storage for green power systems (Regen Fuel Cell, Flywheel, Thermal)***
- ***Extreme power systems***
 - ***Advanced satellite power systems (>90% efficiency)***
 - ***Electrodynamic tethers (ISS)***
 - ***Clean nuclear system***

Opportunities to Address National Needs

- ***Energy independence / Climate Change***
 - ***Storage for Green Power – Flywheels, Fuel Cells, Magnetic etc.***
 - ***Resource Availability – Lithium, etc.***
 - ***Advanced power distribution systems for Power Grid Leveling (Smart Grid)***
 - ***Clean Hybrid Power for Buses, Railroads, Trucks etc.***
 - ***Advanced / clean nuclear systems***
 - ***Biofuels***
- ***Homeland Security.***
 - ***Space and aeronautics reconnaissance -- power beaming, pulse power.***
 - ***Highly integrated power systems for improved payload and reduced power system mass fraction***

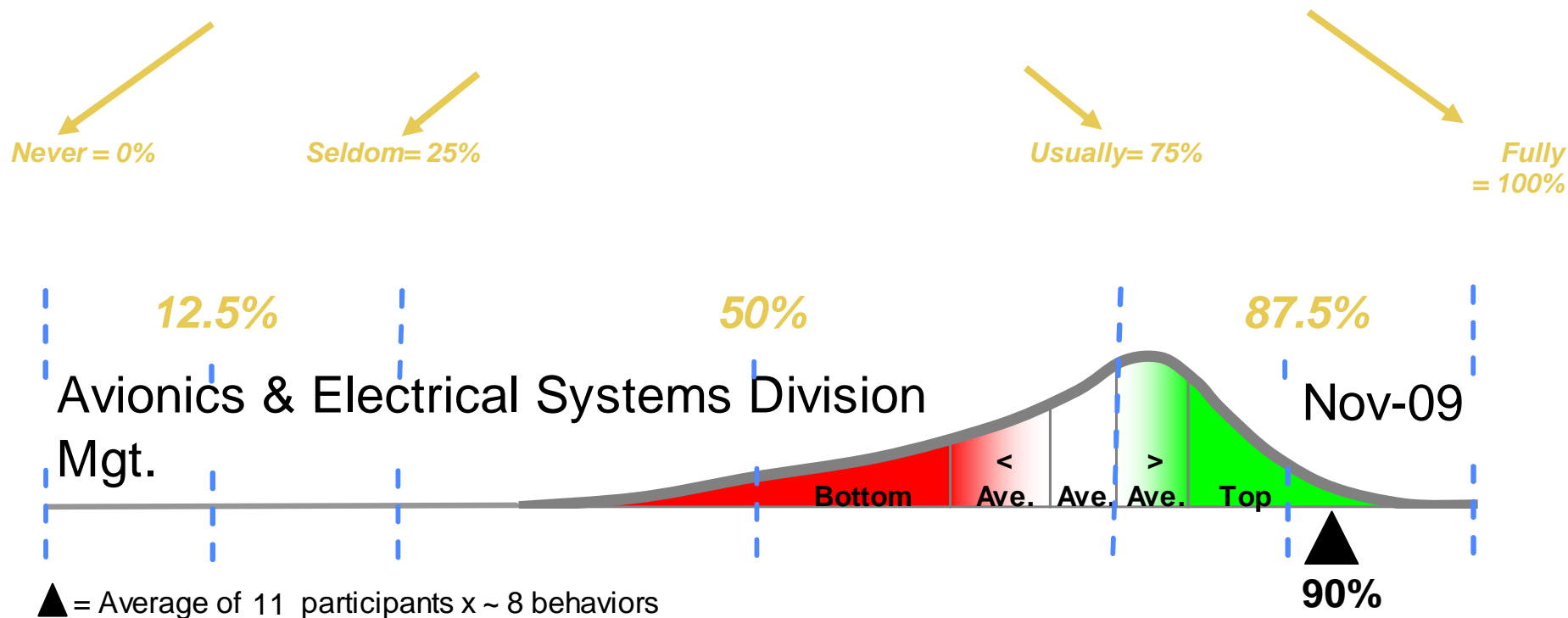


***Team Development Assessment Report
Avionics and Electrical Systems Division
Management
GRC
November '09***

The NASA Chief Engineer, Mike Ryschkewitsch and the Academy for Program / Project Management and Engineering Leadership ("APPEL") directed by Ed Hoffman and Roger Forsgren sponsored this assessment.

Calibrating Scores by Benchmarking

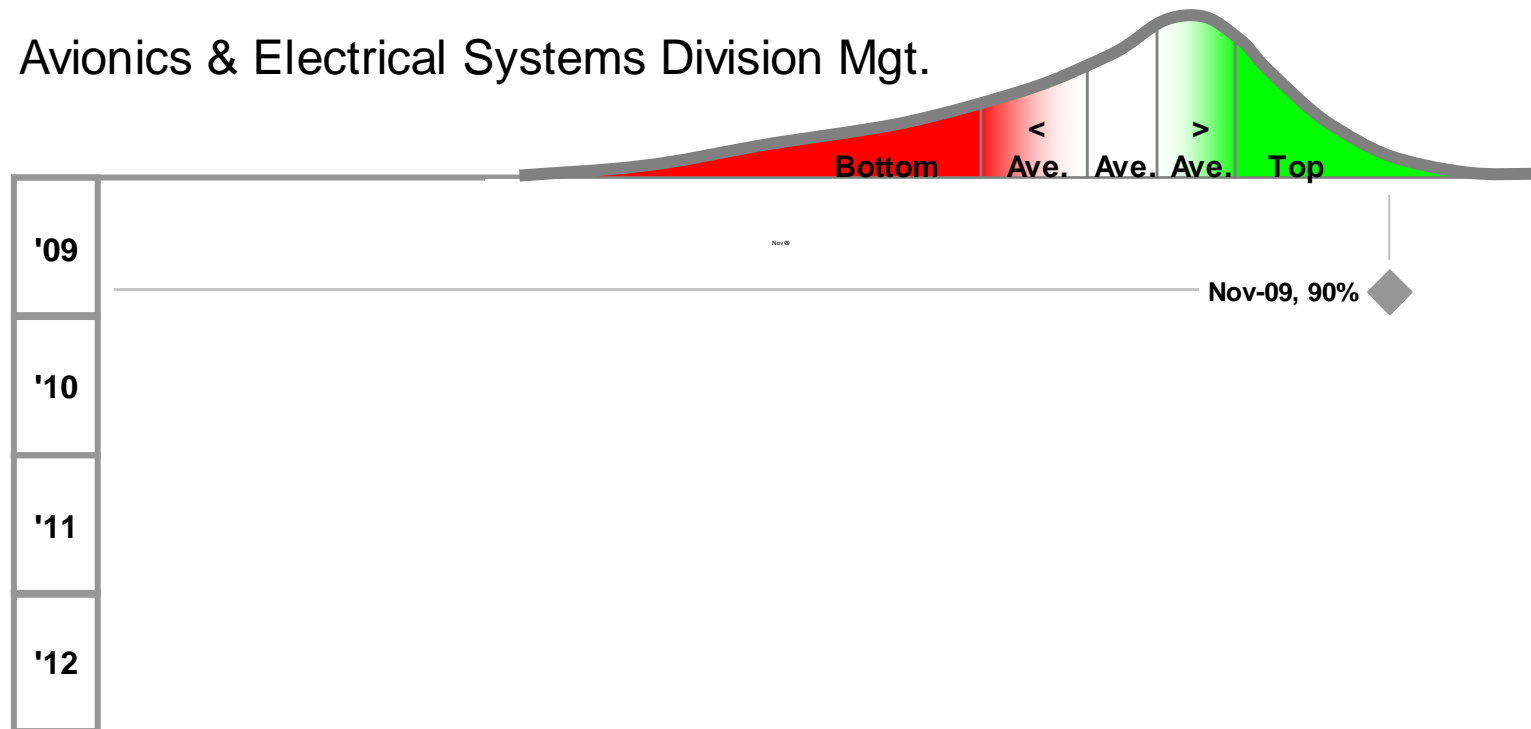
We assign numerical values to the assessment choices.
(And, the in-between choices)



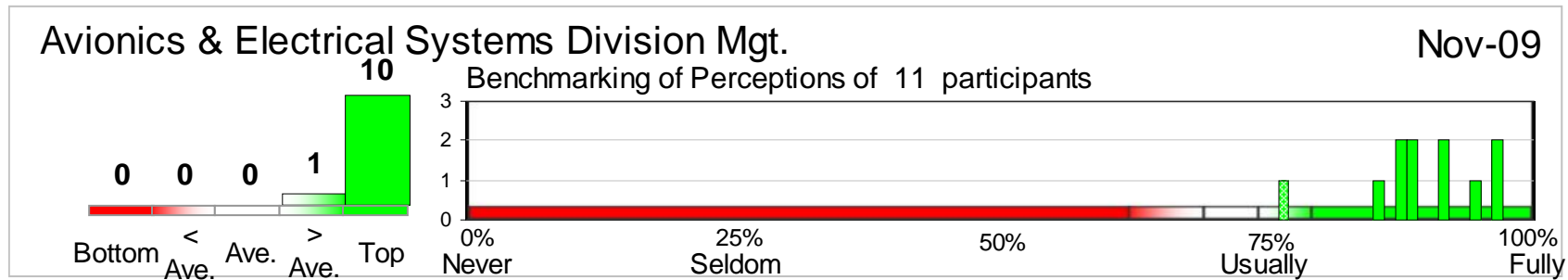
We use 300 other teams' first assessments to benchmark your average score into one of five quintiles.

Trends in Average Scores

Avionics & Electrical Systems Division Mgt.



Distribution of Team Members' Perceptions



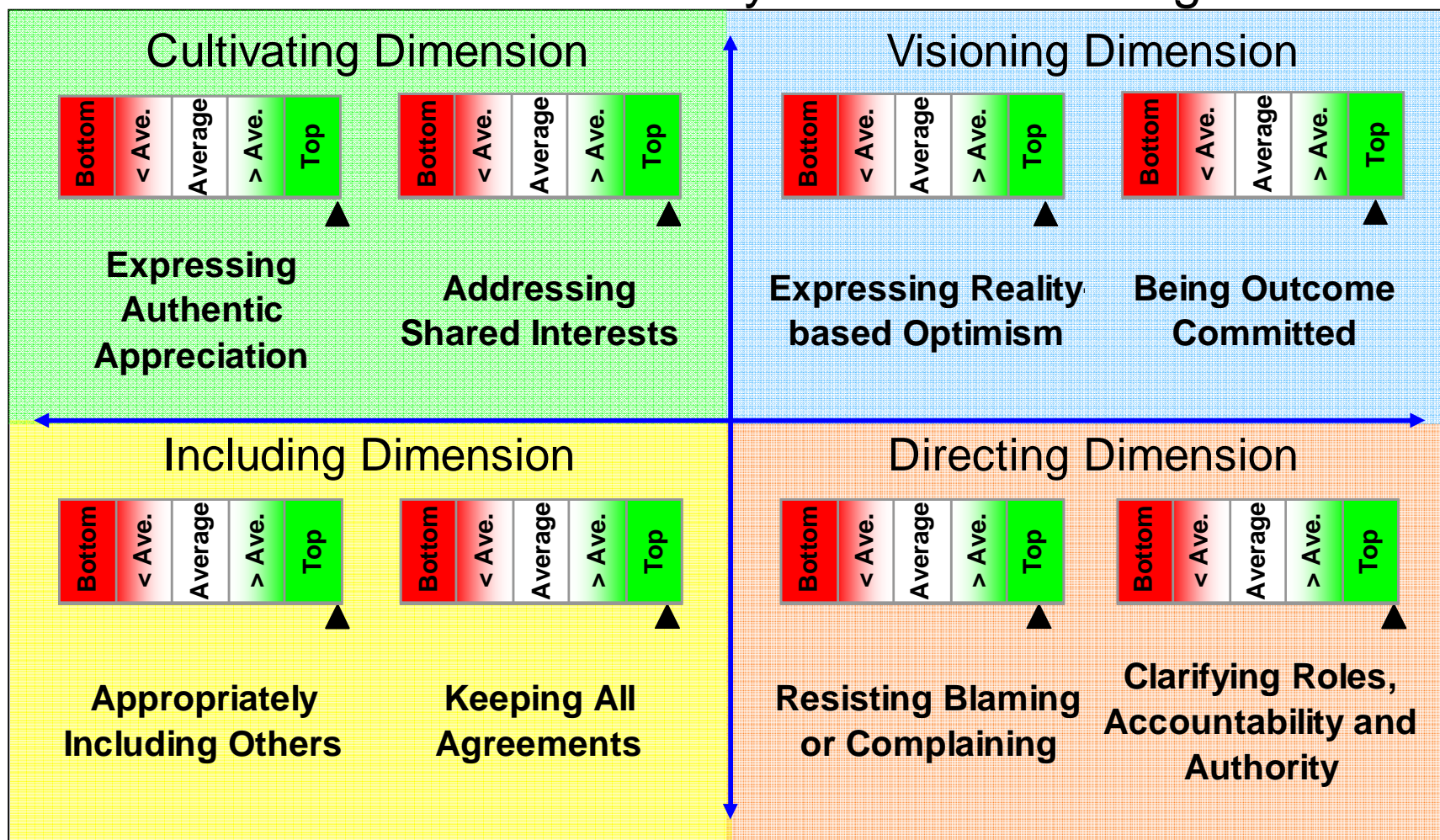
Does your team have “red” bottom quintile respondents?

- **What is the useful mindset to hold about “red” perceivers?**
- **You may be tempted to name them “bad” (if you are not one). This would be a mistake. You dis-empower yourself from constructive action.**
- **Curiosity is the mindset that supports effective action.**
 - **If there are a few “out-of-family” people, learn what’s troubling them.**
 - **If there are lots, look for context-breakers (Which we call the “Seven Deadly Sins”).**
- **Moreover, if you commit to 4-D development, including recurrent assessments, they will inevitably disappear.**
 - **They will change their perception or go elsewhere.**

Relative Ranking of Behaviors

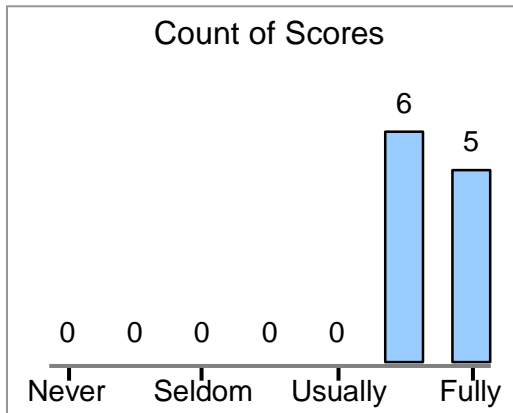
Avionics & Electrical Systems Division Mgt.

Nov-09



Note: Each behavior is separately benchmarked.

Expressing Authentic Appreciation



Teams fully meet the standard when they appreciate others:

- Habitually;
- Authentically;
- Promptly;
- Proportionally; and
- Specifically. (We call this "HAPPS" appreciation.)

Avionics & Electrical Systems Division Mgt.

Expressing Authentic Appreciation

Nov-09



▲ = Average benchmark of your eight behaviors

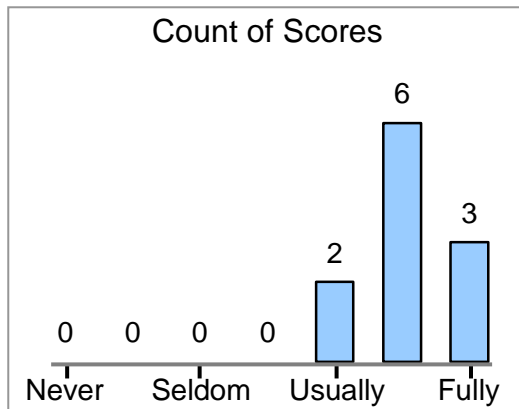
◆ = Benchmark of this behavior

Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Expressing Authentic Appreciation":	
Fully meet the standard		This team does an exceptional job of expressing their appreciation for others contributions. Appreciation is appropriately acknowledged in a timely and unsolicited manner relative to the task or activity.	
Fully meet the standard		The team as well as the team lead go the extra mile to appreciate contributions and accomplishments	
Fully meet the standard		The Division strives to reward it's employees when it is merited and to recognize outstanding work when it is performed. In addition, it does not go overboard trying to reward individuals for "fake accomplishments"	
Fully meet the standard		Team members are very good at expressing appreciation.	

Expressing Authentic Appreciation Cont.

Fully / Usually meet	The division management does a very nice job of expressing authentic appreciation when it is warranted.
Fully / Usually meet	I think that staff personnel do express authentic appreciation almost all the time.
Fully / Usually meet	I feel genuinely appreciated by the other managers.
Fully / Usually meet	As a matter of habit the management team expresses authentic appreciation for each others contributions. Typically this appreciation is prompt, proportionate and specific.

Addressing Shared Interests



Teams fully meet the standard when they:

- Find the interests they share with colleagues, across organizational interfaces, and with their customers; and
- Address these shared interests with their words and actions.

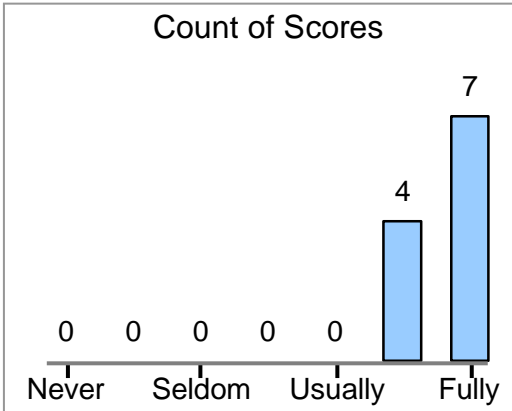


Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Addressing Shared Interests":	
Fully meet the standard		We share common NASA goals since our work is interrelated consequently we all benefit to succeed on the common goals	Nov-09
Fully meet the standard		Team members readily share and seek common interests.	
Fully / Usually meet		The overall team seems to have very good interpersonal relations, shares common goals and tries to work collaboratively to solve problems.	
Fully / Usually meet		The division management is always stressing shared interest when they look at work both internal and external to the division.	
Fully / Usually meet		Team works well together in addressing shared interests across Division (fully meets). There is room for improvement in understanding the interests of other organizations (Outside DP) and finding win-win scenarios. This is not unique to DP.	

Addressing Shared Interests Cont.

Fully / Usually meet	I think we sometimes spend too much time in staff meeting discussing shared interests. John has to drag us back to the topic at hand.....usually some boring action from Harry or Olga that we are stuck doing.
Fully / Usually meet	95% of the time, I feel like we're all pulling as a team toward the same goals.
Usually meet the standard	Team members continuously interface with all elements inside and outside the organization focusing on shared goals and interests that will benefit all through collaboration and commitment.

Appropriately Including Others



Teams fully meet the standard when members:

- **Appropriately include others, sharing power, information, and recognition;**
- **Listen to others until they "feel heard;" and**
- **Avoid thoughtless over-inclusion.**

Avionics & Electrical Systems Division Mgt.



▲ = Average benchmark of your eight behaviors

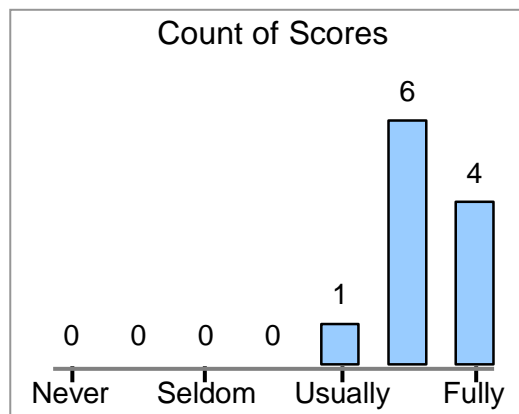
◆ = Benchmark of this behavior

Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Appropriately Including Others":	
Fully meet the standard		This team is very good about including others when appropriate. I usually feel "in the loop".	Nov-09
Fully meet the standard		This group is inclusive and appropriately so. They work well together and are thoughtful about who should be invited. I have observed that people have ample opportunity to speak their mind. Everyone appears to be attentive and participate.	
Fully meet the standard		The team leader seeks inputs from every member of the staff on a weekly basis.	
Fully meet the standard		Management team members are encouraged to bring forward individual viewpoints.	
Fully meet the standard		I always feel included in important discussions, and there is a very free flow of information at weekly staff meetings.	

Appropriately Including Others Cont.

Fully / Usually meet	Yep, we do this quite well...in fact John is very careful to bring in anyone that he feels either has something to contribute or needs to be a part of the discussion.
Fully / Usually meet	The Division Chief and the team are generally very inclusive and share information as appropriate
Fully / Usually meet	Team members have the opportunity to voice opinions, concerns, ideas and suggestions during staff meetings, retreats as well as one-on-one encounters. Only essential personnel are invited to attend meetings or are included in email chains and responses.
Fully / Usually meet	I think the division management does a nice job of thinking about who actually needs to be involved and should be involved in a topic. They also try to include diverse and dissenting points of view.

Keeping All Agreements



Teams fully meet the standard when members:

- **Notice when they are entering agreements;**
- **Only enter those they are able to keep;**
- **Rigorously keep all their agreements; and**
- **Renegotiate problematic agreements before they break them.**

Avionics & Electrical Systems Division Mgt.

Keeping All Agreements

Nov-09



▲ = Average benchmark of your eight behaviors

◆ = Benchmark of this behavior

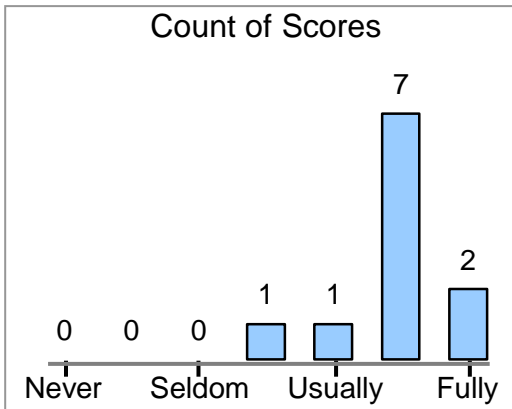


Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Keeping All Agreements":		Nov-09
Fully meet the standard		The team in general is very cautious about making agreements but always keep the ones that they make		
Fully meet the standard		I can't think of any instance where an agreement was broken.		
Fully meet the standard		From my vantage point the division is exceptional at keeping agreements and being open when issues come up.		
Fully / Usually meet		With the fast paced activities that each person is faced with in the division it is very difficult to meet each and every commitment. I believe that folks do a great job of juggling their commitments as best they can.		
Fully / Usually meet		To the maximum extent possible, agreements are kept. External factors sometimes interfere, but there is never complete disregard for agreements.		

Keeping All Agreements Cont.

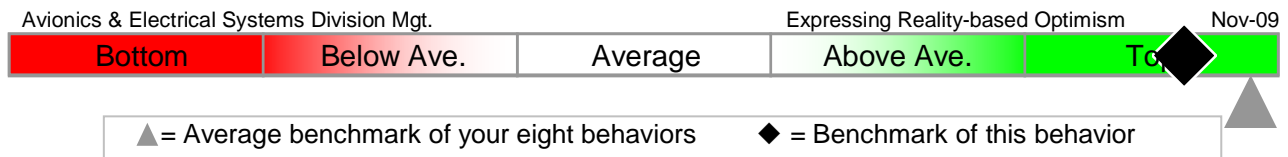
Fully / Usually meet	The division management works hard to maintain the agreements we make, but will break agreements if it is warranted. This sometimes occurs with shifting priorities of work. If we do break an agreement we strive to explain our position to those we affect.
Fully / Usually meet	Team members generally keep their agreements by attending all required meetings. Members assist and support each other in adhering to deadlines and requirements levied upon them by organizational and Center level personnel.
Fully / Usually meet	Team members conscientiously work to meet their commitments. Agreements are typically renegotiated before they are broken. There is also a good dialogue on reaching the agreements. DLE's appear to have a lot on their plate (much of it driven by external interdependencies).

Expressing Reality-based Optimism



Teams fully meet the standard when members:

- **Hold optimistic mindsets;**
- **Embrace reality, no matter how unpleasant; then**
- **Describe an appealing credible future condition.**

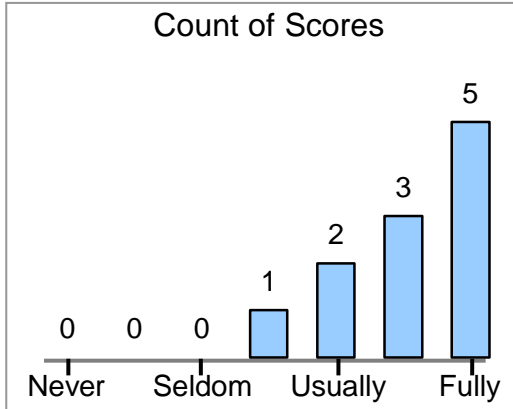


Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Expressing Reality-based Optimism":	
Fully meet the standard		The Division Chief is certainly optimistic in his outlook and mind set. Although, he is realistic he can tend to be overall so. This is counterbalanced by the team which will tend to add realism to deliberations. Overall, the combination seems to work well.	Nov-09
Fully meet the standard		Oh I think we all know what the real story is regardless of the situation.	
Fully / Usually meet		This team does a pretty good job of trying to remain optimistic in the face of the periodic uncertainty that NASA always seems to suffer through.	
Fully / Usually meet		The team is for the most part realistic on goals setting.	
Fully / Usually meet		Sometimes it takes a lot of effort to remain optimistic in light of the current state of the Agency. The team does a remarkable job of balancing an optimistic mindset in light of reality. This realistic optimism is communicated effectively.	

Expressing Reality-based Optimism Cont.

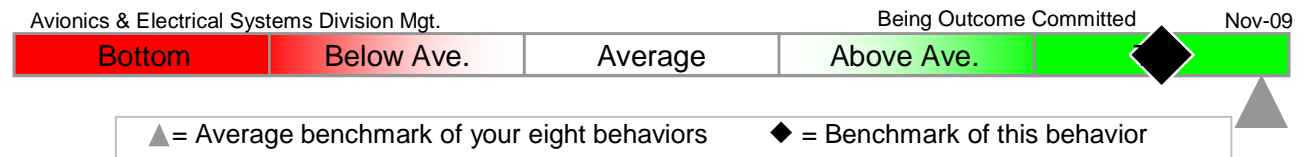
Fully / Usually meet	I think the division management, especially the division chief expresses optimistic mindsets, but realistically evaluates chances for success.
Fully / Usually meet	I feel "realistic optimism" from our team. We have a good balance between planning for that appealing future condition and dealing with the day-to-day tactical reality in an upbeat manner.
Usually meet the standard	In times of uncertainty, the team acknowledges the reality of the situation but remains optimistic in looking for new opportunities and focuses on possible positive outcomes and solutions.
Usually / Seldom meet	Optimism isn't a strength of the management team as a whole, although John Taylor is usually seeing the glass "half-full" when facing adversity.

Being Outcome Committed



Teams fully meet the standard when members:

- **Know the “Outcomes” that they are totally committed to; and**
- **Behave in ways that leave no doubt about their total commitment to these outcomes.**

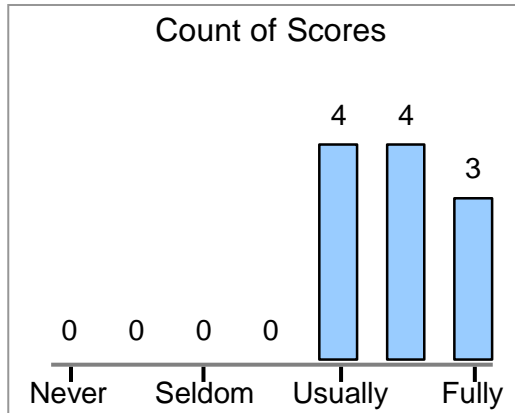


Rating		Nov-09
Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Being Outcome Committed":		
Fully meet the standard	The team knows the Outcomes they are committed to and leave no doubt about their total commitment to these outcomes.	
Fully meet the standard	Once the outcome is properly identified the team is very committed to meeting it.	
Fully meet the standard	No doubt this team is outcome committed. Strive for excellence.	
Fully meet the standard	I see the team as totally outcome committed. The challenge will be to keep this up as the future mission of the agency changes and currently targeted outcomes are potentially replaced. Diane is very helpful in handling us through the administrvia so we can focus on outcomes.	

Being Outcome Committed Cont.

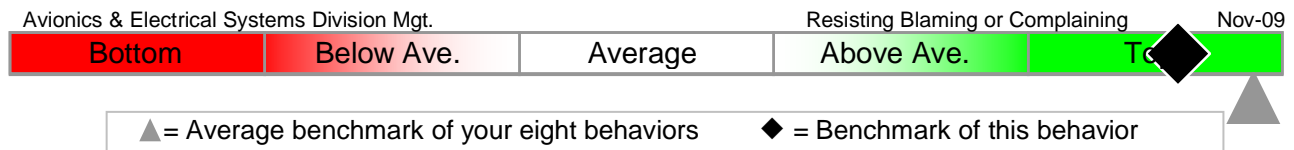
Fully / Usually meet	I think that, realistically, our environment is rife with political considerations and we do a very good job of trying to get the work done regardless of the political consequences.
Fully / Usually meet	I think most of the division management is good about approaching a topic with a positive outcome committed attitude once they understand the value of the approach. A good example of this is the push to develop a Center for Complex Electronics.
Usually meet the standard	When the desired outcome is clear, I always feel we're 100% committed. Unfortunately, external factors and uncertainties don't always allow us to determine the desired outcome.
Usually meet the standard	Team members focus on the factors that affect achieving goals they are committed to and use all available tools and resources (people, meetings, contacts) to reinforce and obtain the desired outcome.
Usually / Seldom meet	The high volume of administrative actions sometimes get in the way of the team being "outcome committed."

Resisting Blaming or Complaining



Teams fully meet the standard when members:

- **Notice they are entering the Blamer or Complainer state and stop;**
- **Are intolerant of blaming or complaining in others; and**
- **Refuse to join complainer "clubs."**

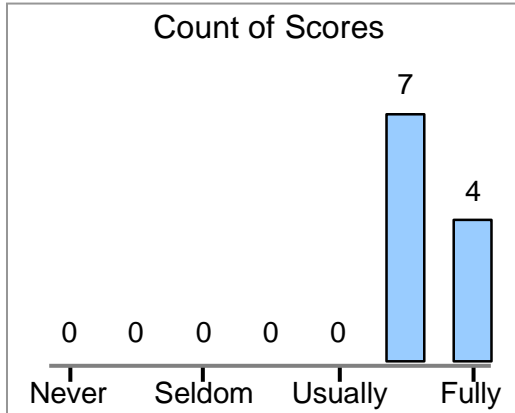


Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Resisting Blaming or Complaining":		Nov-09
Fully meet the standard		We have a very experienced team very well grounded in reality. Complaining usually occurs when people do not understand or they refuse to accept reality. I see NONE of that behavior.		
Fully meet the standard		The Management team does not engage in blaming and complaining amongst themselves.		
Fully / Usually meet		This is a GRC culture, there is always going to be certain level of complaining about upper management.		
Fully / Usually meet		Team members take responsibility when things go wrong and step-up in focusing on finding solutions rather than pointing fingers. Team members take immediate action in finding ways to alter the circumstances resulting in a positive outcome.		

Resisting Blaming or Complaining Cont.

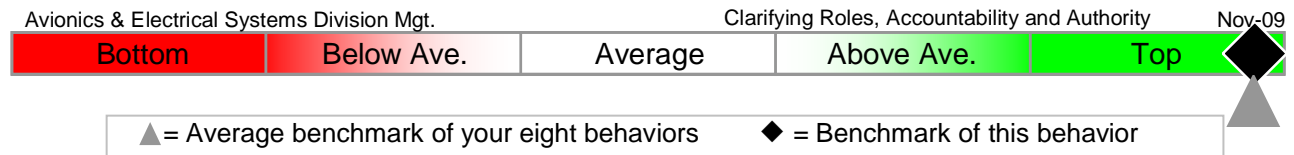
Fully / Usually meet	Most all the members of this team resist blaming or complaining states. We've all been around long enough to know that complaining doesn't accomplish anything.
Fully / Usually meet	I think the division management does a pretty good job of resisting blame when something goes wrong and spends their energy trying to move forward. We do understand the fault that occurred, but try to learn from ours and other's mistakes.
Usually meet the standard	This is a tougher metric to meet....John does a great job but the branch chiefs have a more difficult time meeting this high standard.
Usually meet the standard	These behaviors vary among members of the management team. For some, there is room for improvement.
Usually meet the standard	There is not a great deal of blaming within the team, however, "external forces" outside of the teams control usually cause much consternation within the team

Clarifying Roles, Accountability & Authority



Teams fully meet the standard when members:

- **Clearly define their Roles, Accountability and Authority; and**
- **Communicate their RAAs to the people who need to know them.**



Rating		Our Avionics & Electrical Systems Div. Mgt. team's behavioral norms regarding "Clarifying Roles":	
Fully meet the standard		Within the Division there is no grey areas as far as RAA, but unfortunately this is not the case across the center.	
Fully meet the standard		This team is very good about clearly defining roles and responsibilities.	
Fully meet the standard		Each member knows their role within the team and takes full accountability, individually as well as collectively, for all outcomes and results. Members are given the power and authority to manage their areas of expertise with the knowledge that the collective team is there for assistance and support.	
Fully / Usually meet		We are constantly struggling with the issue of "just what is a DLE and what do we do? or not do?" as well as the other roles of the branch chief. Therefore, I think we are working very hard at grappling with RAAs.	

Clarifying Roles, Accountability & Authority Cont.

Fully / Usually meet	There is alot of work across the center with respect to clarifying roles and responsibilities. I feel we are making good progress within the division, sometimes stepping outside our prescribed RAAs to fill a hole elsewhere.
Fully / Usually meet	The division management is very good about understanding/clarifying the roles and responsibilities we take on.
Fully / Usually meet	Responsibility for actions and task is made very clear
Fully / Usually meet	RAAs for all of our undertakings are negotiated and clearly defined.
Fully / Usually meet	Generally, the management team understands their RAA's and communicated them appropriately. There remain some areas that could use some additional clarification. It would be fruitful to spend some additional time developing RAA's between branches and for engineering leads.

Use this Information to Uplift

- ***Edit highlights from the comments below and post them to remind yourselves of your good work.***

Nov-09

What about the Avionics & Electrical Systems Div. Mgt. team supports good teamwork?

Weekly staff meetings. Lunch outings. Open and honest communication without fear of reprisal. Good natured humor. A sense that everyone is committed to their work and taking care of their people. Excellent admin asst staff committed to team building through holiday and special occasion recognition. The management team works very well together, with no intra-organizational rivalries.

We enjoy each other's company, we have a shared vision of "good engineering", and we respect each other. I have tremendous admiration for the technical and managerial skills of all our team members, and I recognize the critical part each of us plays in the operation of the division.

Very good cooperation among branch chiefs.

There appears to be a good rapport between management team members. People appear to be genuinely happy to be a part of the team. There is good comraderie, respect, communication and participation between team members. A very talented and cohesive team.

The team gets along very well. There is good team work between the management team as well as members of the various organizations.

The managers seem to accept differing opinions and each person is willing to speak up and offer constructive comments during difficult discussions. Periodic lunches build interpersonal relations and good will.

Use this Information to Uplift-2

The attitude that the division chief takes helps promote teamwork and accountability. John pushes the branch chief's to develop plans and execute them. He encourages empowerment of branch chief and employees but will back them up.

Inclusion and appreciation are the two key elements of this organization thus teamwork is a natural outcome.

I believe the team is competent, has high morals, is committed (in a 360 degree fashion), and has high standards. In addition, I think division senior management provides an excellent example for the rest of the team.

I believe the following factors support good teamwork within the Avionics & Electrical Systems Division Management Team: 1. mutual respect 2. camaraderie 3. mutual support 4. shared goals/objectives 5. the ability to laugh with each other

A willingness to help each other out, collaboration instead of competitiveness.

Use this Information as a Source of Action Items

- ***Use this and the preceding information to:***
 - ***Identify three performance-enhancing actions you will take within your team, and***
 - ***Three performance-enhancing actions you will ask for others' help.***

<div data-bbox="1858 613 1938 636" data-label="Text">Nov-09</div> <div data-bbox="289 654 1799 696" data-label="Section-Header"> <h3>What could the Avionics & Electrical Systems Div. Mgt. team do to be more effective?</h3> </div>
<p>We need to learn to deal with poor performing employee's more effectively. Some branch chiefs have done a very nice job of this, but management must present a united front.</p>
<p>The biggest problem that the division faces is that they are not co-located. Team work could be improved if key technical elements we collocated together. In addition, more management staff lunches would be good, but better choices of restaurants need to be made.</p>
<p>I would continue the latest trend of being proactive when it comes to advocating for new work.</p>
<p>Get greater buy-in from Code D management on DP initiatives.</p>
<p>Develop processes that can seamlessly implement DLE role and rigor necessary for spaceflight development projects. The processes need to balance the demands of supervisory and TA responsibilities, establish consistency and not be onerous.</p>
<p>Currently, in this time of transition and uncertainty, we're doing everything we can to be effective.</p>
<p>Co-location in one building would be helpful for promoting more efficient daily communication.</p>